

**WHAT IS CLAIMED IS:**

1        1. An integrated circuit fabrication process, the process comprising:  
2              exposing a photoresist material provided including arylalkoxysilane  
3 over a substrate to a first radiation at a first lithographic wavelength;

4              selectively transforming a top portion of the material in accordance  
5 with a pattern provided on a mask or reticle; and

6              exposing the photoresist material to a second radiation at a second  
7 lithographic wavelength,

8              wherein the first lithographic wavelength is shorter than the second  
9 lithographic wavelength and the transformed top portion of the photoresist material  
10 being non-transparent to the second radiation.

1        2. The process of claim 1, wherein the first lithographic wavelength is  
2 selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.

1        3. The process of claim 1, wherein the second lithographic wavelength  
2 is selected from a wavelength including 365 nm, 248 nm, and 193 nm.

1        4. The process of claim 1, wherein the exposing step with the first  
2 radiation is performed before the exposing step with the second radiation.

1        5. The process of claim 1, further comprising providing the transformed  
2 top portion of the photoresist material as a self-aligned mask for the exposing step  
3 with the second radiation.

1        6. The process of claim 1, wherein the photoresist material is a positive  
2 photoresist material.

1        7. The process of claim 1, wherein the transformed top portion of the  
2 photoresist material comprises polymerized organoarylalkoxysilane material.

1           8.     The process of claim 7, wherein the thickness of the transformed top  
2 portion is at least 10 nm.

1           9.     The process of claim 1, further comprising transferring the pattern of  
2 the mask or reticle onto the photoresist material, wherein a resolution of the  
3 transferred pattern is determined by the first lithographic wavelength.

1           10.    An integrated circuit fabrication system, comprising:  
2                 a first light source providing a first radiation at a first lithographic  
3 wavelength;

4                 a second light source providing a second radiation at a second  
5 lithographic wavelength; and

6                 a self-aligned mask included in a photoresist layer, the self-aligned  
7 mask formed by exposure to the first radiation at the first lithographic wavelength in  
8 accordance with a patterned mask or reticle.

1           11.    The system of claim 10, wherein the first lithographic wavelength is  
2 smaller than the second lithographic wavelength.

1           12.    The system of claim 11, wherein the first lithographic wavelength is  
2 selected from a wavelength including 157 nm, 126 nm, and 13.4 nm.

1           13.    The system of claim 11, wherein the second lithographic wavelength  
2 is selected from a wavelength including 365 nm, 248 nm, and 193 nm.

1           14.    The system of claim 10, wherein the photoresist layer is comprised of  
2 positive photoresist material.

1           15.    The system of claim 10, wherein the self-aligned mask comprises at  
2 least one cross-linked and or polymerized area of a top arylalkoxysilane layer.

1           16. The system of claim 15, wherein the self-aligned mask is located at  
2 the top portion of the photoresist layer and has a thickness between 10 nm and  
3 10000 nm.

1           17. The system of claim 16, wherein each of the polymerized area  
2 prevents the second radiation from transforming the portion of the photoresist layer  
3 correspondingly underneath.

1           18. A method of extending the use of 248 nm and 193 nm photoresists to  
2 lithographic regimes less than approximately 157 nm in an integrated circuit, the  
3 method comprising:

4                 providing a first radiation at a short lithographic wavelength; and  
5                 transforming a top portion of a photoresist layer provided over a  
6 substrate in accordance with a pattern on a mask or reticle, wherein the transformed  
7 top portion on top of the photoresist layer includes at least one polymerized area  
8 where the first radiation is incident thereon and comprises the pattern from the mask  
9 or reticle.

1           19. The method of claim 18, further comprising providing a second  
2 radiation at a long lithographic wavelength after providing a first radiation, wherein  
3 the short lithographic wavelength is smaller than the long lithographic wavelength.

1           20. The method of claim 19, wherein the mask or reticle is omitted at a  
2 second radiation step.

1           21. The method of claim 19, wherein the second radiation is not  
2 transmitted through the polymerized area.

1           22. The method of claim 21, further comprising patterning the photoresist  
2 layer in accordance with each of a plurality of polymerized areas on top of the  
3 photoresist layer and the second radiation, wherein the resolution of the patterned

- 4    photoresist layer is determined by the short lithographic wavelength of the first
- 5    radiation.

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